

AN INTEGRATED AND COLLABORATIVE APPROACH

Integrating Technology in a Beginning Discipline

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An architectural curriculum is a means of training and education. It is not an end in itself, but depends on and serves a philosophy....

At the Illinois Institute of Technology we are concerned among other things with the idea of structure, structure as an architectural concept. We do not design buildings, we construct them, develop them. We are for this reason concerned with the right use of materials, clear construction, and its proper expression.

Since a building is a work to be done and not a notion to be understood, we believe that a method of work, a way of doing, should be the essence of architectural education.

*Mies van der Rohe, Architectural Education
The Architecture Review, 1950.*

The curriculum at the Illinois Institute of Technology is derived from an historic model of sequencing construction and structures technology within the studio. Great significance is attached to the Miesian legacy at IIT. Studio teaching maintains a direct link to the intentions set forth in Mies's inaugural address of 1938 and curriculum of 1941.ⁱ The 1941 curriculum comprised a five-year undergraduate education in architecture with graduate coursework reserved for the development of individual expertise. Given the current configuration of the graduate degree now, as a beginning degree in architecture, the graduate curriculum at IIT reframes beginning design to include construction and structures to enable advanced technical research in later coursework. Rather than consider graduate coursework as the place of developing individually directed learning, the program also looks at the collaborative nature of practice today. The beginning studio emphasizes collaboration as essential to leadership and innovation in contemporary practice and technology. The pairing of integration and collaboration promotes 'a studio as laboratory of learning environment' and teaches a method of work for subsequent learning.

Mies developed IIT's curriculum from 1938-58 with the help of Walter Peterhans and Ludwig Hilbersheimer. The curriculum was defined in terms of means (materials), purpose (building types) and planning and creating (mechanistic and idealistic principles).ⁱⁱ The first year taught basic drafting or graphic literacy, the second year, simple short span wood and masonry construction, third year, mid-span steel and concrete structures, fourth year, long span structures and space problems and fifth year, a complete building project. Two additional subjects, planning and visual training complemented the studio. Planning, as conceived by Ludwig Hilbersheimer, was the logical distribution of program elements relative to human behavior and environmental considerations. Taught by Walter Peterhans, Visual Training practiced aesthetic discipline. Planning and visual training provided a parallel and fundamentally related set

of practices. Courses entitled “Architecture I, II, ...” were dedicated to building practices and the studio was the place of solving building problems.

Learning was a sequential process expanding the scope and scale of problems but never omitting material, construction, structures and technologically contemporary practices. Of note, there were no stand-alone courses in materials and methods. This coursework lay within the confines of the studio. Courses in structures were offered but structural practices, calculations and clarity was present in the studio at all times. Architectural education consisted of a well-defined series of problems to be solved as opposed to the exploratory design exercise format of today. Creative work was believed to be only applicable to those students capable of exceeding the basic learning expectations.

The program grew from a department of less than 50 students before WWII to a fairly stable 125 students in 1958 when Mies left IIT. Leadership at the College was passed on to former students of Mies in a silent mantra of internal knowledge.ⁱⁱⁱ The call for change came in 1989 with the appointment of Gene Summers as dean of the College of Architecture. New faculty members, with no connection to IIT, were invited to open up the curriculum for reinterpretation. After fifty years, Mies’s educational model was the subject of active debate. Ironically, with a certain amount of consensus and deference to heritage, the curriculum retained, at its core, a commitment to imbedding construction, structures and building practices in studio learning. What changed were the methods of delivery, flexibility in project type and an acceptance of new explorations that included aesthetics and planning as “design” content in the architecture studio.

The intimate teaching under Mies’s direction allowed for the singularity of a common ‘philosophy’. With Mies absent and enrollment increased to 400 students by 1978 and 800 by 2006, this singularity could no longer be sustained. In the 90’s, team teaching was instituted as a method of delivering consistency and debate to larger classes of students. This afforded new opportunities for leadership, dialogue and exploration of projects types. The curriculum was eventually stratified by year under coordinated teams. Newer projects replaced older building problems opening up the educational experience from a linear approach to a more broadly accepted integrated introduction to design and technology.

The concept of a broad and diverse curriculum is counter-intuitive to Mies’s step-by-step approach toward learning. Most models of architecture education today (unlike Mies) resist any single identity and prefer a “state of flux” that allows for the convenient adaptation of new undefined possibilities.^{iv} Interpreting IIT’s 50 year old prescriptive program of education and its’ spirit of intent harbors the possibility of broadening a curriculum without entirely embracing an open range of non-structured diversification. Fritz Neumeyer describes, in his article for *A World in Itself: Architecture and Technology*, Mies’s desired convergence between architecture and technology. “For Mies, the merging of technology and aesthetic modernism embodied the promise of culture suited to the age, one in which form and construction, individual expression and the demands of the times, as well as subjective and objective values would converge into a new identity.”^v In the article, Neumeyer traces Mies’s shifting attempt to resolve an

inherent conflict between art and technology in his professional work. Similarly, Mies spoke of this when describing the shortfalls of the mechanistic and idealistic principles in his inaugural address. The current curriculum in essence accepts the convergence and the conflict between art and technology as it seeks to balance past and present by exploring the aesthetic possibilities of material studies as applied to beginning design.

INTEGRATING AND COLLABORATING

Within the Master of Architecture three-year curriculum, the first year investigates relationships between material properties and construction methods, structural typologies and space definition. The studio sequence is developed with the following objectives:

- Introduce architecture as an integrated practice that unifies material, construction technology, structure, space and intention.
- Promote collaborative practice as essential to research and professional practice.
- Emphasize materials and applications as fundamental components of architecture.

The goal is to raise the students' awareness to opportunities in the complexity of practice, to encourage leadership through research and informative collaboration, and to establish their role as a catalyst for innovation. Projects are designed to promote the following habits.

Collaboration and Collective Learning: Communicating ideas and intentions.

Projects involve the students in a collaborative process, with each individual contributing to the knowledge and advancement of the group. The fluid collaboration inherent in the program begins with the faculty. The course is team taught by two architects in association with a structural engineer to provide students with varied insights and appropriate expertise. Associating with a structural engineer integrates specialized teaching in the working process. Faculty members model an approach to capitalizing on professional differences.

Frequent group projects and public reviews encourage the students to learn from each other's strengths, acknowledge the value of their peers and to elevate their own critical perspective of larger goals. The quality of the work and the scale of production reward the students for their collaborative efforts. Risk taking and safety find a natural balance in the process. Dialogue and debate fosters the articulation of thought and intent. Clarifying intentions cultivate strategies of compromise. Leadership emerges in the process.

Engaging Scales and Process: Exploring materials, construction, structures.

Hands-on processes and varied mediums promote work at many levels: two-dimensions and three, reduced and full-scale, virtual and temporal. The recurrence of materials, in multiple scales and contexts, builds familiarity with the subject through mastery of craft, and clarity of work process. The College's architectural model shop provides all students access to wood, masonry, concrete and steel fabrication. Physical models emphasize a specificity of craft relevant to the working intention and process. Alternating the scale of

projects links abstract intentions and material realities. Structural theory and intuition converge as physical models increase in dimension and intensity.

Research and innovation: Establishing parameters, identifying potential.

From case studies to material properties, research helps develop an understanding of architectural contexts, industry standards, construction processes and structural concepts. Parameters are determined by material and construction applications. The potential of applications, such as post-tensioning, pre-stressing or lightweight reinforcing, define an exploration, with all decisions impacting the outcome. The parameters and potential of both an idea and a project lead to innovation in assembly methods and structural details. Whether working with polymer resin milk crates or steel cables, self-driven tests of material strengths and construction details support project development. Innovative applications promote ‘a sense of wonder’ through the intelligent use of materials and structures.

THE WORK

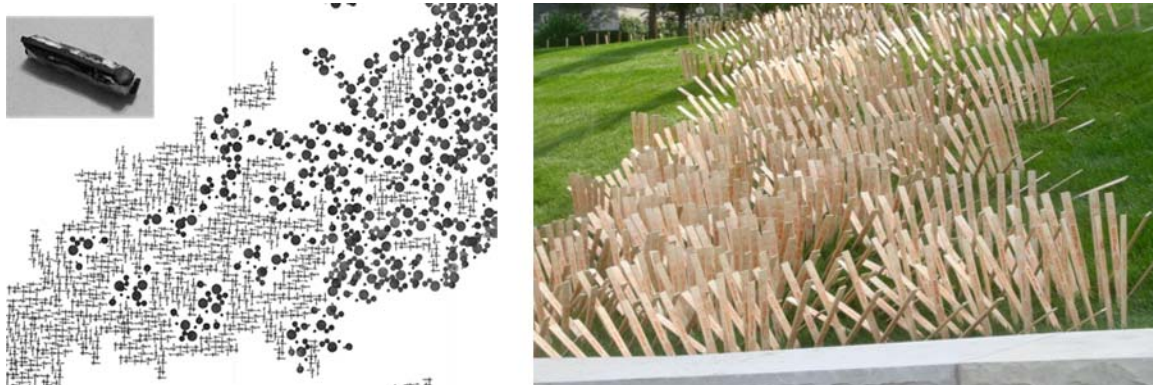


Figure 1 – Stamp field and site installation

Material and Mark

Beginning with a blank page, a white vinyl eraser, an x-acto knife and an ink pad, the compositional idea of ‘field’ is explored through the making of a tool and the placing of marks. The relationship of technique, process and intent are experienced from the perspective of tool making and marking. From the page, the concept of field expands to a collective and collaborative ‘marking’ of the urban landscape. The choice of material and technique confront issues of context, scale, procedure, and the intended manifestation of a publicly engaging field. Within three weeks, students, individually and in teams, are afforded a microscopic view of what it means to act on an idea and to compare the scale of the page as it is translated into the expansiveness of the public realm. From marking the page to sculpting the landscape, the investigation of technique and intention address material and space, figure and ground, form and field.



Figure 2 – Bale, bale, box

Object and Space

Students next explore the intimacy of space definition through a literary text. Drawing from Kobo Abe's *The Box Man* or Bohumil Hrabal's *Too Loud a Solitude*, a pair of projects explores common materials, not as merely 'raw' resources, but as part of a cultural context, with their own histories, purpose and unique identities. The material's geometry, scale and structure is examined in the making of both object and space, or bale and box, in the case of *Too Loud a Solitude*, and in *The Box Man*, a device for voyeurism and a place of concealment. Idea and intention define the relationship of object and program, material and space. Whether wood, lint, corrugated cardboard or a recycled door, the materials' inherent qualities and structural properties determine the technique of fabrication and its' method of assembly. The abstract and the real converge in a tactile material investigation.

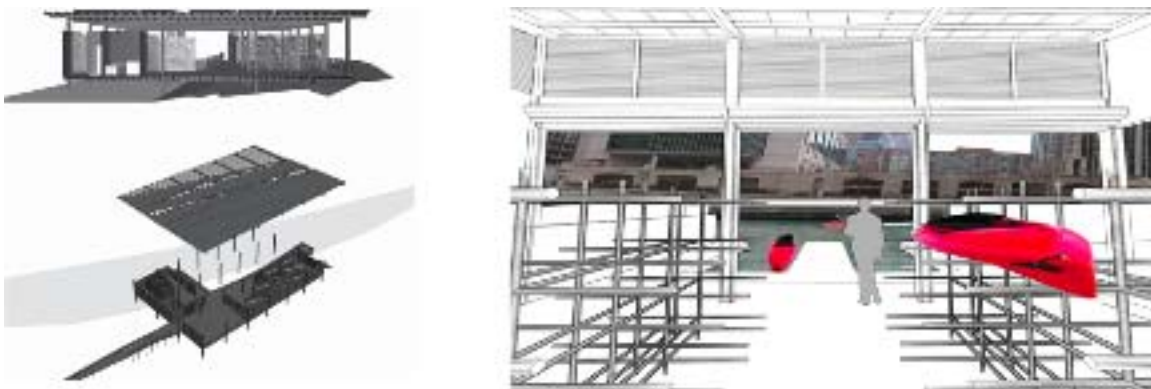


Figure 3 – Kayak center

Body and Building

An architecturally specific project links material, object and space with issues of program, context and assembly. On the river's edge, site of the earlier field installation, the kayak, the shed and the sportsman frame the introduction of wood construction in building design. The complexity of the design process is negotiated from idea and intention, to material concept and spatial definition. The relationship of the body to the boat and the building organizes aspects of spatial dimension in the context of an urban site. Likewise, the building is considered as an assembly of components roof, wall, floor, with specific spatial identities. Wood is examined for its' potential as a lightweight

building material in post and beam, frame or prefabricated component construction. The previous abstract investigation provides an initial grounding for the introduction of building materials without the immediate specificity of construction technology.



Figure 4 – Construction case studies Thermal Baths at Val, St. Benedict chapel, Imai hospital day care center

Material Section

Precedent studies, of wood and masonry construction, concentrate on buildings as assemblages and stress contemporary construction technology. Model-based studies emphasize building construction practices and component fabrication as a means of understanding the integration between material properties, construction, function and intention. Models are produced at a scale sufficient to reconcile weather barriers, insulation, and flashing and are built from foundation to roof. Support lectures highlight differences between conventional and innovative construction practices. Each case study is accompanied by extensive documentation of particular material properties and building processes. Comparisons are made between buildings in terms of historical advancements, regional technology and climate, design intent, and material affect.



Figure 5 –Engineer/architect Paul Endres and students with dynamic models of Sendai Mediatheque, Gateshead Millennium Bridge and 80 South Street residential tower

Dynamic Structure

Within the studio, structural concepts are presented through lectures and demonstrations. Dynamic or flexible working models are made of existing innovative structures as case studies illustrating structural principles and forces. With a hands-on and visual approach,

the models demonstrate the primary, secondary and tertiary structural systems of buildings and bridges. These raw structural models reveal the interaction of forces, the nature of material form, and applications of structural principles. The dialogue between the models as active devices, the class and the lead engineer encourages a visual and intuitive understanding of structures. It demystifies engineering as an isolated profession and situates structures as a manageable component of building conception. The project encourages an active relationship between engineers and architects, structures and architecture.

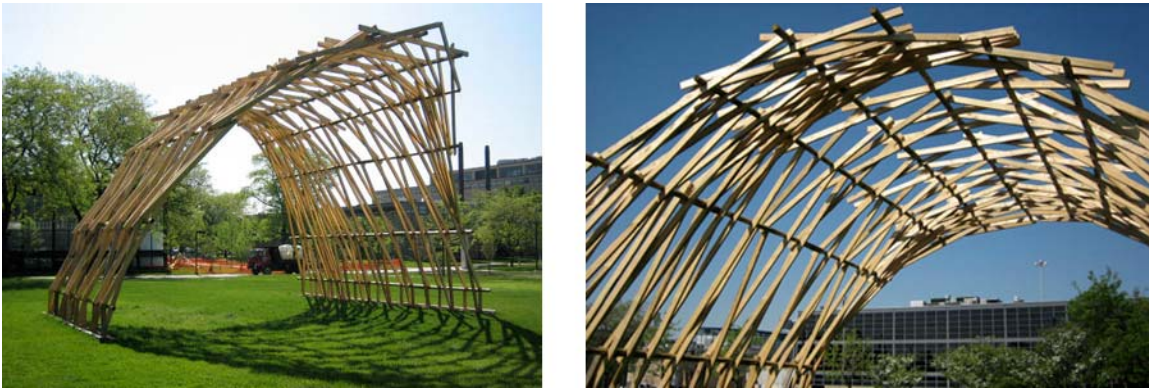


Figure 6 – 2 x 4 parabolic wood vault based on a three-point compression structure

Full-Scale Construction

The final project of the year emphasizes a full-scale exploration of material, construction and structure. A material, the urban campus and an intention form the parameters for collaboration, on site-specific projects for the year-end student exhibition. The structural and construction knowledge of the case studies is applied to a full-scale structural spatial construct. A material investigation is required; promoting a sense of wonder is encouraged. Past projects have included a 35' high parabolic wood vault, a one-fourth-scale concrete cantilever shell, a 100' span wood and steel cable bridge, and a pre-tensioned milk crate ensemble. Each team determines the project parameters, evaluates the intent, assembles a plan and executes the building process.

Projects are encouraged to test the limits of a material. Research, with the aid of industry experts and college faculty, offers additional expertise in novel construction techniques. Using university equipment, materials and joints are stress tested to evaluate their performance ability. Material tests, mock-ups and detail studies inform the construction process. Economy, re-use and temporality are additional project determinates.

The final project is intended to mimic field installation with added complexity. The yearlong acquired knowledge is joined to produce a work of size and intent greater than a single student is capable of executing, a public work, a mark on the landscape, a space, an event. The collaborative process expands the study of architecture to a collective effort and the collective experience allows for the large-scale achievement of work. Students realize that an idea gains elasticity through research, experimentation and clarity of intention. Integrating material studies, construction practices and structural concepts in

the final project reinforces the relationship of material, functional and spiritual means in architecture.

As a series, these projects present a methodology of personal and collaborative explorations related to intent and materiality in architecture. The varying scope of abstract and concrete applications provides a conceptual grounding for the architectural design process. Correlations between process and intent, experience and research, craft and technology develop the discipline as a whole and define the tasks of the architect in the creative process. The curriculum provides a broad base to build an understanding of the physical as well as cultural design context or as Mies describes the mechanistic and the idealistic condition. Students identify, analyze, evaluate, resolve and communicate complexities of thought, ideas and process, not for the satisfaction of the assignments, but to realize their potential for development in the design and building process.

Geoffrey Broadbent sites the working tension of education and the profession with one correcting the other.^{vi} Academic theory proposes new models of work while the profession absorbs those that advance practice; reciprocally, new methods of practice are idealized in the academy. Each force provides a balancing act. As noted earlier, Martin Pierce and Maggie Toy, in *Educating Architects*, describe architectural education itself as a “state of flux” struggling to be both diverse and disparate providing the broadest scope. In critique of this broadening, universities give credibility to marginal viewpoints without a full scrutiny of their value to the profession. Daniel Liebeskind in this same text insinuates that homogenous teachings of a “kind of frozen theory, implying a blind acceptance of certain rules and regulations cannot run a school any longer. We know this from the totalitarian modern experience and all the –isms that are bygone now.”^{vii} In appraising the ever-diverse profession of architecture and the Miesian desire for a particularized grounding of education lends value to a method of working, a way of doing as an essence that does not necessarily predicate an outcome but affords the means of engagement.

Through the integration of technology in the beginning design studio, the abstract and the concrete form a working tectonic relationship. Introducing collaboration propagates a change in studio learning from a self-centered venue to a collective discipline. Leadership and team building skills become second nature to the design professional. Collaboration across disciplines is not novel but is expected. Edward Said in *Beginnings: Intention and Method* distinguishes the context of beginning as a designated moment in time, a place, a principle, or an action in order to indicate or designate a later condition.^{viii} The beginning, for Said, is the first point of an accomplishment or process that has duration and meaning. Considering beginning design studios as something greater than a foundation proposes a later condition or application. It has the potential of situating early learning in a larger context. When beginning design studios actively engage in issues such as collaboration and technologically challenging work, students are given the tools to advance their own education and the profession.



Figure 7 – Milk crate ensemble and lightweight concrete pavilion model

ⁱ Swenson, Alfred and Chang, Pao-Chi, *Architectural Education at IIT 1938-1978*; Chicago: Illinois Institute of Technology, 1980; p. 19-28.

ⁱⁱ Harrington, Kevin, Order, Space, Proportion – Mies's Curriculum at IIT: *Mies van der Rohe: Architect as Educator*, Chicago: Mies van der Rohe Centennial Project, Illinois Institute of Technology: Distributed by University of Chicago Press, 1986; p.56.

See also Neumeyer, Fritz, *The Artless Word: Mies van der Rohe on the Building Art*, Cambridge: MIT Press, 1991; p. 220-223.

ⁱⁱⁱ Nicholson, Ben, Renouncing Autistic Word: *The Presence of Mies*; New York, 1994; p. 119-120.

^{iv} Pierce, Martin and Toy, Maggie, Introduction, *On Education*; London: Academy Group Ltd., 1995, p. 7-8.

^v Neumeyer, Fritz, A World in Itself: Architecture and Technology: *The Presence of Mies*; New York, 1994; p. 71.

^{vi} Broadbent, Geoffrey, Architectural Education: *On Education*; London: Academy Group Ltd., 1995, p. 10.

^{vii} Liebeskind, Daniel, Architectural Education: *On Education*; London: Academy Group Ltd., 1995, p. 89.

^{viii} Said, Edward, *Beginnings: Intention and Method*; New York: Columbia University Press, 1985.